

# Type I and Type II Checkpoint

## Question (1)

Food inspectors inspect samples of food products to see if they are safe. This can be thought of as a hypothesis test with the following hypotheses.

- $H_0$ : the food is safe
- $H_a$ : the food is not safe

The following is an example of what type of error?

*The sample suggests that the food is safe, but it actually is not safe.*

**A:** type I


**B:** type II

**C:** not an error


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### Feedback


**A : 0**

 Not quite right. The statement describes a situation where we fail to reject a false null hypothesis. A Type I error requires that we reject the null. The correct answer is B.

**B : 10**

 Good job! The statement describes a situation where we fail to reject a false null hypothesis. This is a Type II error.

**C : 0**

 Incorrect. The statement describes a situation where we fail to reject a false null hypothesis. This is an error. The correct answer is B.

## Question (2)

Food inspectors inspect samples of food products to see if they are safe. This can be thought of as a hypothesis test with the following hypotheses.

- $H_0$ : the food is safe
- $H_a$ : the food is not safe

The following is an example of what type of error?

*The sample suggests that the food is not safe, but it actually is safe.*

**A:** type I

**B:** type II

**C:** not an error

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### Feedback

**A : 10**



Good job! The inspector's conclusion here is that  $H_0$  is false (the food is not safe). But  $H_0$  is actually true (the food is safe.)

**B : 0**



Not quite right. The inspector's conclusion here is that  $H_0$  is false (the food is not safe). But  $H_0$  is actually true (the food is safe.) A Type II error requires that we fail to reject  $H_0$ . The correct answer is A.

**C : 0**



Incorrect. The inspector's conclusion here is that  $H_0$  is false (the food is not safe). But  $H_0$  is actually true (the food is safe.) There is an error. The correct answer is A.

## Question (3)

A manufacturer of rechargeable laptop batteries markets its batteries as having, on average, 500 charges. A consumer group decides to test this claim by assessing the number of times 30 of their laptop batteries can be recharged and finds the average is 497, with a standard deviation of 10. The resulting p-value is .1111; thus, the null hypothesis is not rejected. The consumer group concludes that the manufacturer's claim that its laptop batteries can be recharged, on average, 500 times is accurate.


What type of error is possible in this situation?

- A:** type I
- B:** type II
- C:** neither
- D:** both


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### Feedback


**A : 0**

 Incorrect. With a type I error, we reject a null hypothesis that is true. In this hypothesis test, the consumer group failed to reject the null hypothesis; therefore, it is impossible to have a Type I error. The correct answer is B.


**B : 10**

 Correct. The consumer group failed to reject the null hypothesis. With a type II error, we fail to reject a null hypothesis that is false.

**C : 0**

 Incorrect. One of the two types of errors is always a possibility. In a hypothesis test, there are two possible conclusions, and each conclusion comes with the possibility of one of these errors. Since we failed to reject the null hypothesis, it is possible that a Type II error was committed; therefore, the correct answer is B.

**D : 0**

 Incorrect. It is never possible to make both of these errors at the same time. In a hypothesis test, there are two possible conclusions, and each conclusion comes with the possibility of one of these errors. Since we failed to reject the null hypothesis, it is possible that a Type II error was committed; therefore, the correct answer is B.

## Question (4)

A 2011 survey, by the Bureau of Labor Statistics, reported that 91% of Americans have paid leave. In January 2012, a random survey of 1000 workers showed that 89% had paid leave. The resulting p-value is .0271; thus, the null hypothesis is rejected. It is concluded that there has been a decrease in the proportion of people, who have paid leave from 2011 to January 2012.


What type of error is possible in this situation?

- A:** type I
- B:** type II
- C:** neither
- D:** both


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### Feedback

**A : 10**

 Good job! We rejected the null hypothesis. With a type I error, we reject a null hypothesis that is true.

**B : 0**

 Incorrect. With a type II error, we fail to reject a null hypothesis that is false. Since we rejected the null hypothesis, it is impossible to have a Type II error. Therefore, the correct answer is A.

**C : 0**

**X** Incorrect. One of the two types of errors is always a possibility. In a hypothesis test, there are two possible conclusions, and each conclusion comes with the possibility of one of these errors. Since we rejected the null hypothesis, it is possible that a Type I error was committed; therefore, the correct answer is A.

**D : 0**

**X** Incorrect. It is never possible to make both of these errors at the same time. In a hypothesis test, there are two possible conclusions, and each conclusion comes with the possibility of one of these errors. Since we rejected the null hypothesis, it is possible that a Type I error was committed; therefore, the correct answer is A.

## Question (5)

Suppose the results indicate that the null hypothesis should be rejected; thus, it is possible that a Type I error has been committed. Given the type of error made in this situation, what could researchers do to reduce the risk of this error?

**A:** Choose a .01 significance level, instead of a .05 significance level.

**B:** Increase the sample size.

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### Feedback

**A : 10**

✓ Good job! They could choose a .01 significance level instead of a .05 significance level, which would decrease the chance of making a type I error from 5 percent to 1 percent.

**B : 0**

✗ Thatâ€™s not quite right. Increasing sample size would be the best way to reduce the chance of making a type II error. As this is a type I error, the best approach would be to change the significance level from .05 to .01.

## Question (6)

Suppose the results indicate that the null hypothesis should not be rejected; thus, it is possible that a Type II error has been committed. Given the type of error made in this situation, what could researchers do to reduce the risk of this error?


**A:** Choose a .01 significance level, instead of a .05 significance level.

**B:** Increase the sample size.


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### Feedback

**A : 0**

 That's not quite right. Choosing a smaller significance level will decrease the chance of a type I error, because it will make it more difficult to reject the null hypothesis. As this is a type II error, the best approach would be to increase the sample size.

**B : 10**

 Good job! Increasing the sample size is the best way to reduce the likelihood of a type II error.